



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification<sup>5</sup> :

H04B 1/08

A1

(11) International Publication Number:

WO 93/18591

(43) International Publication Date:

16 September 1993 (16.09.93)

(21) International Application Number: PCT/US92/10351

(22) International Filing Date: 3 December 1992 (03.12.92)

(30) Priority data:

844,079

2 March 1992 (02.03.92)

US

(71) Applicant: MOTOROLA, INC. [US/US]; 1303 East Algonquin Road, Schaumburg, IL 60196 (US).

(72) Inventors: HAMILTON, Robert, W. ; 1133 Bayview Drive, Tsawwassen, British Columbia V4M 2R8 (CA). ZIBRIK, Larry, J. ; 114-8751 General Currie Road, Richmond, British Columbia V6Y 3T7 (CA).

(74) Agents: PARMELEE, Steven, G. et al.; Motorola, Inc., Intellectual Property Dept., 1303 E. Algonquin Road, Schaumburg, IL 60196 (US).

(81) Designated States: CA, JP.

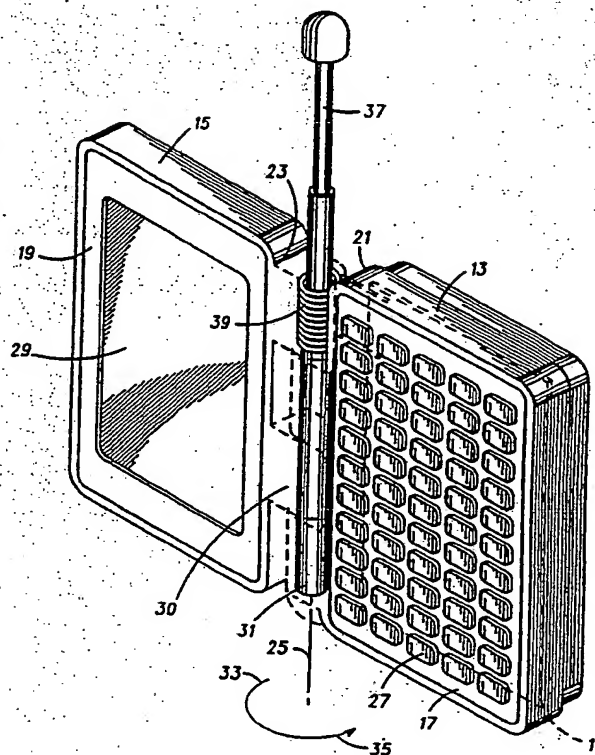
Published

With international search report.

(54) Title: PORTABLE COMMUNICATIONS DEVICE

## (57) Abstract

A portable communications device including a first and second housing (13, 15) pivotally connected by a hinge arrangement (30) and arranged for cooperatively containing wireless radio circuitry. The hinge arrangement (30) contains an integral antenna arrangement for coupling radio frequency signals to the wireless radio circuitry and thus the physical size of the portable communications device may be reduced.



**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	FR	France	MR	Mauritania
AU	Australia	GA	Gabon	MW	Malawi
BB	Barbados	GB	United Kingdom	NL	Netherlands
BE	Belgium	GN	Guinea	NO	Norway
BF	Burkina Faso	GR	Greece	NZ	New Zealand
BG	Bulgaria	HU	Hungary	PL	Poland
BJ	Benin	IE	Ireland	PT	Portugal
BR	Brazil	IT	Italy	RO	Romania
CA	Canada	JP	Japan	RU	Russian Federation
CF	Central African Republic	KP	Democratic People's Republic of Korea	SD	Sudan
CG	Congo	KR	Republic of Korea	SE	Sweden
CH	Switzerland	KZ	Kazakhstan	SK	Slovak Republic
CI	Côte d'Ivoire	LJ	Liechtenstein	SN	Senegal
CM	Cameroon	LK	Sri Lanka	SU	Soviet Union
CS	Czechoslovakia	LU	Luxembourg	TD	Chad
CZ	Czech Republic	MC	Monaco	TG	Togo
DE	Germany	MG	Madagascar	UA	Ukraine
DK	Denmark	ML	Mali	US	United States of America
ES	Spain	MN	Mongolia	VN	Viet Nam
FI	Finland				

## Portable Communications Device

### Field Of The Invention

5

This invention relates to communications devices including but not limited to portable communications devices using radio frequency signals for communications.

10

### Background Of The Invention

Generally, the demand for wireless communications has evolved to the point where portable equipment is highly desirable.

15 At the same time the level of sophistication or complexity of the equipment, reflecting user demands and desires, has dramatically increased and a strong preference for smaller products has developed.

The above factors, among many, have created intense  
20 pressure on practitioners to invent smaller portable communications devices that may include comparatively large or bulky items such as batteries, antennas and user interface devices, for example, keypads, comparatively elaborate displays, etc. Responding to user needs and for various reasons, practitioners  
25 have invented portable communications devices which utilize multiple housings to contain the radio circuitry along with a battery and relatively large antenna arrangement. Using multiple housings may provide greater surface area for user interface devices such as keypads, displays, etc, and/or provide a cover and  
30 thus protection for user interface devices, and/or allow the physical dimensions of the portable device, such as a cordless telephone or portable data terminal to increase when the device is being interactively used. Practitioners have shown numerous ways of utilizing the multiple housings including mounting the

radio circuitry in one housing and the antenna in a second housing in for example, a cordless telephone.

In any event, given a multiple housing, some arrangement for, at least mechanically, connecting the multiple units together, as one, will ordinarily be required. This arrangement, typically a hinge, like the antenna and some user interface devices, may be comparatively large in order to provide the physical strength required to service and survive a portable communications device environment. This relatively large hinge, without more, is contrary to the essence of the requirements of a portable communications device, namely a small compact efficiently packaged unit.

Clearly a need exists to more efficiently utilize the physical space that may be occupied by the hinge and thus reduce the overall physical size of a portable communications device.

### Summary Of The Invention

This invention addresses the aforementioned needs and problems by teaching a portable communications device including wireless radio circuitry for processing a radio frequency signal and a first and a second housings arranged and constructed for cooperatively containing the wireless radio circuitry, wherein the first and the second housing respectively include a first surface and a second surface disposed along an axis. Further included is a hinge apparatus, encompassing a volume disposed along the axis, that pivotally connects the first and the second surfaces such that the second surface pivots about the axis between a first position and a second position, wherein the first position allows substantially enhanced access to the first surface, and an antenna arrangement, disposed within the volume, for coupling the radio frequency signal to the wireless radio circuitry.

### Brief Description Of The Drawing

5 The features of the present invention which are believed to be novel are set forth with particularity in the appended claims. The invention, itself, however together with further advantages thereof, may best be understood by reference to the accompanying drawing, FIG. 1, of a portable communications device constructed in accordance with the present invention.

10

### Detailed Description Of A Preferred Embodiment

15 The drawing is representative of a portable communications device and includes wireless radio circuitry (11), that may, as depicted, be mounted on a substrate such as a printed circuit board, and is used for processing a radio frequency signal. The radio circuitry (11) is contained within a first housing (13) and a second housing (15) that have been arranged and constructed for  
20 cooperatively containing the wireless radio circuitry (11).

The first housing (13) includes a first surface (17) and the second housing (15) includes a second surface (19). The first surface (17) includes at least one edge (21) and the second surface includes at least one edge (23), such that the edges (21, 23) are disposed  
25 along, substantially parallel with, an axis (25). In practice, the surfaces (17, 19) may be used for mounting user interface devices such as a keypad (27) or display (29).

A hinge arrangement (30) is utilized to pivotally connect the second housing (15) to the first housing (13) about the axis (25).  
30 The hinge arrangement (30) is disposed along the axis (25) and encompasses a volume (31). Pivoting the second housing (15) about the axis (25) from a first position (33), as depicted, to a second position (35), for example through a 180° rotation, will substantially limit user access to the first and the second

surfaces(17, 19). Correspondingly, returning the second housing (15) to the first position (33) will expose the first surface (17) and the second surface (19) and allow substantially enhanced access to the first surface (17) as well as the second surface (19). This access  
5 will allow the user to operate the portable communication device, whereas the lack of access may correspond to protecting the user interface devices from inadvertent activation or damage and/or a desired reduction in physical dimensions.

An antenna arrangement (37) is disposed within the  
10 volume (31). The antenna arrangement (37) couples the radio frequency signal(s) to the wireless radio circuitry by for example, inductively coupling the radio frequency signal via inductor (39). Depending on the specific antenna arrangement required, due to for example, operating frequency, etc, the antenna arrangement  
15 (37) may be of the telescoping variety such that it may be extended for greater efficiency as required.

By utilizing the volume (31), that is otherwise ordinarily substantially required by the hinge arrangement (30) alone, for containing and mounting the possibly relatively large antenna  
20 arrangement (37), a significant savings in the size of the first housing (13) and/or second housing (15) may be realized. The instant invention may thus be advantageously utilized to reduce the physical size of portable communications devices.

## Claims

1 A portable communications device comprising in combination:

5 wireless radio circuitry for processing a radio frequency signal;

first and second housings arranged and constructed for cooperatively containing said wireless radio circuitry, said first and second housing respectively including a first surface and a second surface disposed along an axis;

10 hinge means, encompassing a volume disposed along said axis, for pivotally connecting said first and said second surfaces such that said second surface pivots about said axis between a first position and a second position, wherein said first position allows substantially enhanced access to said first surface; and

15 antenna means, disposed within said volume, for coupling said radio frequency signal to said wireless radio circuitry.

2       A portable communications device in accordance with  
claim 1 wherein said first surface includes first means for user  
interface to said wireless radio circuitry.

5       3       A portable communications device in accordance with  
claim 2 wherein said second surface includes second means for  
user interface to said wireless radio circuitry.

4       A portable communications device in accordance with  
10       claim 1 wherein said antenna means is arranged in a telescopic  
fashion so as to provide greater efficiency when extended.

5       A portable communications device in accordance with  
claim 1 wherein said antenna means is inductively coupled to said  
15       wireless radio circuitry.

6       A portable communications device in accordance with  
claim 5 wherein said antenna means is arranged in a telescopic  
fashion so as to provide greater efficiency when extended.

20       7       A portable communications device in accordance with  
claim 1 wherein said second surface is pivoted through an angle of  
up to 180° when going from said first position to said second  
position.





## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US92/10351

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(5) :H04B 1/08

US CL :455/351

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 455/89,90,128,129,347,343/702,856

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
<b>X</b> <b>Y</b>	US,A, 4,126,863 (Kotwaite) 21 November 1978 see col. lines 25-60.	1,4 and 7 2-3 and 5-6
<b>Y</b>	US,A, 4,992,799 (Garay) 12 February 1991 see col. 1, lines 45-65.	1-7
<b>Y</b>	US,A, 4,180,819 (Nakano) 25 December 1979 see col. 4 lines 4-20.	5



Further documents are listed in the continuation of Box C.



See patent family annex.

* "A"	Special categories of cited documents: document defining the general state of the art which is not considered to be part of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E"	earlier document published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O"	document referring to an oral disclosure, use, exhibition or other means	"G" document member of the same patent family
"P"	document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

17 FEBRUARY 1993

Date of mailing of the international search report

20 APR 1993

Name and mailing address of the ISA/US  
Commissioner of Patents and Trademarks  
Box PCT  
Washington, D.C. 20231

Facsimile No. NOT APPLICABLE

Authorized officer

EDWARD URBAN

Telephone No. (703) 305-4385

Form PCT/ISA/210 (second sheet)(July 1992)\*

**This Page is Inserted by IFW Indexing and Scanning  
Operations and is not part of the Official Record**

**BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ **BLACK BORDERS**
- ☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- ☐ **FADED TEXT OR DRAWING**
- ☐ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- ☐ **SKEWED/SLANTED IMAGES**
- ☐ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- ☐ **GRAY SCALE DOCUMENTS**
- ☐ **LINES OR MARKS ON ORIGINAL DOCUMENT**
- ☐ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- ☐ **OTHER:** \_\_\_\_\_

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.**